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AUTHOR Morris, June E.; And Others
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ABSTRACT

The final report describes a project to facilitate the efficiency with which legally blind persons use their remaining vision. The project developed a diagnostic assessment procedure, a design for instruction which includes 150 sequenced lessons, and a sourcebook on low vision. The reliability and validity of the diagnostic assessment procedure were evaluated with 112 legally blind students. Reliability and content validity were found to be high, but some questions existed about the test's construct validity. The entire program was field tested by 11 teachers of legally blind students who responded to questionnaires on the kit's effectiveness and on each specific component. A number of problems in the materials were identified and corrected, resulting in the final version, Program to Develop Efficiency in Visual Functioning. (CL)

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Revision of the Utilization of Low Vision Kit

June E. Morris, Project Director
American Printing House for the Blind, Inc.
1839 Frankfort Avenue
Louisville, Kentucky 40206

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FOREWORD

The Program to Develop Efficiency in Visual Functioning was made possible through Grant No. G007605448 awarded the American Printing House for the Blind by the Bureau of Education for the Handicapped; U.S. Office of Education; Department of Health, Education, and Welfare. The new program is based on the earlier Utilization of Low Vision Kit (Barraga, 1970) which was disseminated nationally as a cooperative project by the author, the Bureau of Education of the Handicapped, the American Printing House, and a national group of consultants.

The Utilization of Low Vision Kit has been well received and widely used since its publication by the American Printing House. However, research by Ozias (1975) revealed the need for extensive revision and expansion of both its components; namely, the Visual Efficiency Scale and the Teacher's Guide. The purposes of the project in which the new program was developed were to (a) revise and expand the teaching materials, (b) revise and expand the Visual Efficiency Scale into a diagnostic assessment procedure, and (c) develop basic student materials.

The Program to Develop Efficiency in Visual Functioning has resulted from the cooperative efforts of Natalie C. Barraga and her staff at the University of Texas at Austin, who were responsible for developing the program materials, and the research and development staff at the American Printing House, who were responsible for evaluation of the materials. Both were supported and assisted by a group of knowledgeable consultants.

ACKNOWLEDGEMENTS

The combined efforts of many persons have made possible the new Program to Develop Efficiency in Visual Functioning--the product resulting from this project. American Printing House for the Blind staff who worked on the project included Edward Berla', Amie Dennison, June Morris, Carson Nolan, Deborah Willis, and other members of the Department of Educational Research. Project staff at the University of Texas at Austin included Natalie Barraga, Marcia Collins, James Hollis, Douglas Ozias, Alice Anne Parsons, and Mildred Smith. Working with the project staff were consultants from throughout the country who had the kinds of expertise needed to provide guidance and advice in the development of the program materials. These persons included Marianne May Apple, Edward Berla', Joyce Bromley, Pat Carpenter, Ruth Holmes, Wilma Hull, Randy Jose, Rosemary O'Brien, Douglas Ozias, Earl Rankin, Rona Shaw, Rose Skolnick, Mildred Smith, and Dean Tuttle. More information about these consultants is given in Appendix A of this report. The consultants met early in the project to help determine specifications for the then envisioned product. Subsequently, they reviewed drafts of the software and, where feasible, used the materials with appropriate students. Throughout, they worked constructively and diligently with the project staff. In the evaluation phase of the materials another set of persons, teachers and their students, from throughout the United States and Canada contributed to the project. These teachers critiqued the materials as they used them and, simultaneously, provided student data. All of this information was used in the development of the Program to Develop Efficiency in Visual Functioning. The program represents a vastly revised and expanded Utilization of Low Vision Kit.

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Abstract

The purpose of the project was to develop a program that would facilitate the efficiency with which legally blind persons use their remaining vision. The content of the program was based upon a review of literature pertaining to low vision, visual perception, and visual development and information received from teachers of the visually handicapped. In its final form the program consists of the following components:

Diagnostic Assessment Procedure which is a 40-item instrument for determining level of visual functioning and identifying appropriate lessons for use

Design for Instruction which includes 150 lessons sequenced to increase visual efficiency

Source Book on Low Vision which includes extensive material on low vision and its use as well as materials lists for low vision, a glossary, and a bibliography.

Throughout the development of the program a panel of consultants reviewed all the materials of each component before they were field-evaluated. The Diagnostic Assessment Procedure was evaluated by administering it twice to 112 legally blind students ages 5-20. Reliability coefficients showed the Diagnostic Assessment Procedure to have high internal consistency (KR - 20 = .94) and to be highly accurate (test - retest, r = .96). In the final phase of the project the complete program was used by 11 teachers of the visually handicapped with 22 legally blind students. The program was given high ratings by all teachers. Without special training or instructions other than the instructions provided in the program, these teachers were able to use the program efficiently with their students.

In 1964 Barraga's publication, Increased Visual Behavior in Low Vision Children, attracted worldwide attention in the field of the visually handicapped. Barraga's (1964) study demonstrated that the efficiency with which handicapped students use their residual vision could be increased with specific, systematic training. The original study was then replicated successfully by Ashcroft, Halliday, and Barraga (1965) and later Holmes (1967) demonstrated the efficacy of the concept with older students. In 1970, leaders in the field of the visually handicapped recognized the acute need for a broad dissemination effort to prepare teachers to provide visual efficiency training to all children and youth with useful vision, which constitutes about 79% of those classified as "legally blind." Subsequently, the American Printing House for the Blind assumed responsibility as a coordination center for a program that published and distributed materials for a series of institutes on the utilization of low vision. These institutes were supported by funds from the Office of Education, U.S. Department of Health, Education and Welfare. The materials and training procedures used in these institutes were collectively named the Utilization of Low Vision Kit.

The primary components of the Utilization of Low Vision Kit were the Visual Efficiency Scale (Barraga, 1970b) and the Teacher's Guide (Barraga, 1970a). The Visual Efficiency Scale consisted of 48 items printed in black and white. The items involve either matching or noting likenesses and differences in visual stimuli and range in size from large (3/4 inch [2 cm]) geometric forms to small (8 point) type. The visual skills necessary to respond to the progressively more difficult items include discrimination of solid and outline geometric and object figures in decreasing size; discrimination of spatial position and pattern detail in abstract figures and objects; and discrimination of letter and word symbols singly and in groups. Instructions for administration and use of the scale are included. Profile sheets enable the teacher to chart levels of visual functioning and assist in identifying visual skills already present as well as those needing to be learned. From the profile, individualized plans for specific aspects of visual learning can be projected.

The Teacher's Guide is primarily a series of suggestions based on the rationale that visual development in low vision students progresses satisfactorily only through a sequence of visual learning experiences and that visual efficiency increases in relation to expanded visual skills and the learning experiences. General objectives are outlined for (a) observing visual functioning with materials, (b) recognizing visual potential, (c) fostering positive attitudes about looking, and (d) encouraging and reinforcing use of vision in general activities. A series of objectives for visual development and increased visual efficiency is outlined, a sequence of activities is suggested to promote the achievement of each objective, and numerous appropriate visual materials to be used are identified.

A study of the reliability and validity of the Visual Efficiency Scale with low vision children (Harley & Spollen, 1973) revealed content validity and internal consistency. However, about 1/3 of the items on the scale did not show discrimination between high and low scorers. The suggestion was made that some items might be placed inappropriately according to efficiency ratings and that some identified visual behaviors did not have representative discriminatory items.

Since the Utilization of Low Vision Kit was published in 1970, the author, Natalie Barraga, has worked with teachers in many residential and public school programs in every part of the United States and in Canada, Australia, England, and Brazil. Almost without exception, suggestions have indicated that greater precision in identification of specific visual behaviors to be achieved would be valuable. Many have expressed concern verbally about apparent gaps in the sequence of activities suggested in the Teacher's Guide. Teachers who work with preschool and/or retarded or multihandicapped children and youth have requested suggestions for observation, assessment, and programming at much lower levels of visual functioning. In addition, Ozias (1975) surveyed teachers who attended the institutes and used the materials and documented numerous suggestions with respect to the Teacher's Guide and the Visual Efficiency Scale that indicated considerable revision of the Utilization of Low Vision Kit was needed.

Specification and Development of the Components for the Program to Develop Efficiency in Low Vision Functioning

Purpose

The purpose of this project was to revise and expand the Utilization of Low Vision Kit into a more comprehensive and detailed program that could be utilized by vision teachers to evaluate visual functioning in low vision, legally blind persons and to train such persons to use their vision more efficiently. The components of the total program were specified and included the following:

1. Theme and Organization of Complete Program which provides an introduction and overview of the program

2. Diagnostic Assessment Procedure which includes instructions for administering the procedure, 40 assessment items interfaced with the lessons, and all materials needed for use with the assessment items

3. Design for Instructional Plan which includes basic information essential for implementation of the training program and 150 lessons sequenced to increase visual efficiency

4. Supplemental Source Book which includes the materials lists, a glossary, a bibliography, and sections pertinent to the use of vision, but nonessential for implementation of the

program (e.g., major eye conditions and their influence on visual functioning, magnification and low vision aids, illumination and visibility factors, etc.).

Procedure

In order to develop each of the components specified, over 100 articles were reviewed in the areas of visual perception (e.g., attention, fixation, accommodation, etc.), normal visual development, and in other areas relating to visual impairment and low vision (e.g., visual acuity and visual functioning, screening targets, magnification and optical aids, lighting and visibility factors, etc.). From this, a review of the literature was written (Barraga, Collins, & Hollis, 1977) in which research findings were summarized and related to eight levels reflecting the normal developmental sequence of visual functioning, which were as follows:

awareness--visual sensations and intake of visual information

visual information and beginning discrimination of contours and forms in simple tangible objects

discrimination and recognition of environmental contours

visual information and beginning discrimination and recognition of form and detail in represented materials

discrimination, recognition, and perception of simple and complex pictures of actions, scenes, and situations

organization of visual perceptions

discrimination, recognition, and perception of abstract representations

discrimination, recognition, and perception of abstract numbers and letter symbols

Simultaneously, an array of specific visual functions (e.g., focus, accommodation, fixation, tracking, etc.) were identified and sequenced into optical, optical and perceptual, and visual perceptual categories to form an outline for development of both the instructional program and the assessment procedure. The rationale for the program is based upon the idea that the functions performed by the visual system interact with the visual/perceptual developmental level of the individual in specific environments to produce a certain degree of visual efficiency (Barraga & Collins, 1979).

In addition to reviewing the literature, visual assessment instruments and teachers' guides on early childhood readiness, reading readiness, and visual perceptual development were inspected for content, format, and packaging. This information was used in

developing specifications for the materials that are included in the final program. Since many of the commercial materials identified were readily available to teachers, a decision was made to provide tangible materials only for the Diagnostic Assessment Procedure and not for the 150 lessons. Lists of commercially available materials that could be used with the lessons were provided. The materials lists included annotations and sources. However, all graphics for the lessons were provided.

During the first 2 years of the project, drafts of the Theme and Organization of the Complete Program, the Diagnostic Assessment Procedure and the Design for Instructional Plan were completed and refined. Simultaneously, graphic and tangible materials required for use with the assessment procedure were acquired or developed. Subsequently, all of the materials were sent to the project's consultants for independent expert review.

Fourteen professional persons with special knowledge and interest in low vision or test construction served as consultants for this project. A list showing the persons serving in this capacity is shown in Appendix A. During the project's 1st year the consultants met to provide initial direction and input to the development of specifications for the various components of the program. During the 2nd year the consultants reviewed and, in some instances, used the materials under development and subsequently met with the project staff regarding them. The purpose of the meeting was to come to a group consensus, where possible, regarding matters about which the review information was ambiguous. Following this meeting, the Diagnostic Assessment Procedure immediately underwent modification and was readied for a field evaluation. Simultaneously, the initial draft of the Supplemental Source Book was completed and sent to six of the project consultants for review. The reviewers' comments and suggestions were tabulated and appropriate revisions were made. The Design for Instruction was developed during the first 3 years of the project. A committee of six persons reviewed each of the 150 lessons and appropriate changes in both content and format were made as a result of the review.

Psychometric Evaluation of the Diagnostic Assessment Procedure

The purpose of this phase of the project was to psychometrically evaluate the Diagnostic Assessment Procedure with respect to its internal consistency, test-retest reliability, content, and construct validity (Berla', Rankin, & Willis, 1980).

Method

Subjects. The subjects for this study were selected on the basis of the following criteria:

1. a minimum developmental level of 5.5 years in age

2. a minimum of 1 year in a structured educational setting (kindergarten and up)

3. legally blind (20/200 visual acuity or less in the better eye with corrective lens or a visual field of 20 degrees or less) with a minimum of light perception

4. no additional physical or mental handicaps that would interfere with performance on the test

The subjects were 112 legally blind pupils attending schools in the United States (California, Georgia, Kansas, New Hampshire, New York, Oregon, Texas, Massachusetts, Washington) and Canada (Ontario). All subjects were volunteers. There were 60 males (54%) and 52 females (46%) with 89 subjects from public schools (79%) and 23 subjects from residential schools (21%). Each subject was classified into one of nine visual categories using the classification system of visual acuity proposed by the National Society for the Prevention of Blindness. For the purposes of this study another category (X) was added to take into account those subjects who had only restrictions in visual fields of less than 20 degrees but whose visual acuities were greater than 20/200. The number and percentage of subjects in each of the visual categories is shown in Table 1.

Table 1

The Number and Proportion of Subjects in the Testing Sample for Each of the Visual Categories and the Proportion of Subjects for the 1976 Quota Registration Reported by the American Printing House

Visual Categories		Number	Proportion of sample	Proportion of 1976 quota (Willis, 1979)
I	20/200 - 18/200	59	.54	.40
II	17/200 - 13/200	5	.05	.04
III	12/200 - 08/200	21	.19	.12
IV	07/200 - 03/200	4	.04	.03
V	2.5/200 - .4/200	1	.04	.01
VI	Counts finger	7	.06	.05
VII	Hand movements (includes "forms" and object perception)	5	.05	.05
VIII	Light projection and/or perception (includes shadows)	6	.05	.12
IX	Totally blind	0	-	.18
X	Restricted visual field (20 degrees or less)	2	.02	
		110		

Note. The information on two subjects' visual acuity was incomplete and consequently the data reported in this table were based on 110 subjects instead of 112. The reader should note that the visual categories in this study were slightly different from those used by Willis (1979). If the Willis data were recalculated to conform to this category system, then it would slightly increase all of the percentages she reported. As a consequence, these sample proportions would approximate her population proportions even more closely than they already do. These proportions compare favorably to those reported by Willis (1979) using the 1976 quota registration figures of the legally blind students attending residential and public schools in the United States as compiled by the American Printing House for the Blind. Consequently, the results of this study can be generalized to the legally blind population of school age students. The reader should note that totally blind persons were excluded from this study and, consequently, there were no students classified in category IX.

The incidence of the eye disorders/causes represented in the subjects is shown in Table 2. The reader should note that the total incidence of 211 exceeds the sample size of 112 because most of the subjects were diagnosed as having more than a single eye disorder. The large number of eye disorders in the sample attests to the great heterogeneity of visual disabilities in the population.

The subjects' ages ranged from 5-20 years. The median age was 10.5 years.

Table 2

Diagnoses and/or Causes of the Eye Disorders Represented in the Testing Sample (Arranged by Incidence)

	Name given	Incidence
1.	Nystagmus	38
2.	Cataracts	22
3.	Myopia	13
4.	Optic Atrophy	13
5.	Albinism	11
6.	Aniridia	9
7.	Aphakia (5 indicated as surgical)	8
8.	Glaucoma	8
9.	Columba	7
10.	Estotropia	6
11.	Microphthalmos	6
12.	Retrolental Fibroplasia (RLF)	5
13.	Emblyopia	4
14.	Enucleation	4
15.	Retinitis Pigmentosa	4
16.	Rubella	4
17.	Exotropia	3

Table 2 (cont.)

	Name given	Incidence
18.	Myopic Astigmatism	3
19.	Retinoblastoma	3
20.	Aebiomatopsia	2
21.	Astigmatism (see 38, also 18)	2
22.	Corneal Scarring	2
23.	Hyperopia	2
24.	Hypoplasia	2
25.	Macular Degeneration	2
26.	Optic Nerve Damage	2
27.	Retinischis	2
28.	Abnormal Macula	1
29.	Abnormal Optic Nerve Function	1
30.	Anomalies (multiple)	1
31.	Anterior Clevage Syndrome	1
32.	Batten's Disease	1
33.	Choroiditoid	1
34.	Coats' Disease	1
35.	Corneal Vascularization	1
36.	Gun Wound	1
37.	Histoplasmosis	1
38.	Hyperopic Astigmatism	1
39.	Hyperplastic Primary Vitreous	1
40.	Microcornea	1
41.	Myopic Degeneration	1
42.	No Diagnosis	1
43.	Photophobia	1
44.	Prosthesis (same as 14)	
45.	Ptosis	1
46.	Retinal Degeneration	1
47.	Retinal Hypoplasia Schisis of Retina (see 27)	1
48.	Strabismus	1
49.	Tapeto	1
50.	Toxoplasmosis	1
51.	Tumor	1
52.	Viral Encephalitis	1
	Total	211

Materials. The Diagnostic Assessment Procedure consists of 40 items ranging from the simple task of detecting a light to the most difficult items of writing letters and reading simple words. The 40 items of the Diagnostic Assessment Procedure are broken down into eight categories that correspond to specific functional visual tasks. Because certain categories were more heterogeneous thant others, a different number of questions were required to adequately sample the behaviors in the different categories. The eight categories with the number of items in each category (shown in parentheses), along with examples of test objectives, are as follows:

A. Awareness of visual stimuli (2)

Item No. 1. "Learner will turn eyes, head, and/or body to light source."

B. Movement control of eyes, discrimination of shape and color (4)

Item No. 3. "Learner will look from one light to the other."

C. Exploration, discrimination, use of objects (6)

Item No. 7. "Learner will see two lines and move between them."

D. Discrimination and identification of pictures of objects, people, actions (12)

Item No. 14. "Learner will match solid color geometric shapes in pictures."

E. Memory for detail, part whole relationships, figure-ground discrimination (4)

Item No. 25. "Learner will identify object partially hidden in picture."

F. Discrimination, identification, reproduction of abstract figures and symbols (4)

Item No. 29. "Learner will match abstract figures by single inner detail."

G. Perception of relationships in pictures, abstract figures, symbols (4)

Item No. 33. "Learner will relate inner detail in figures of different size."

H. Identification, perception, reproduction of symbols of single and combined symbols (4)

Item No. 37. "Learner will identify letters in different type styles."

Each item specifies the visual task, the materials, the directions for administering the item, and the specific response required of the learner in order to be considered correct.

All materials specific to administering an item are self-contained.

Procedure. Twelve teachers of the visually handicapped were selected to be evaluators. The criteria for selection were as follows:

1. Interest in participating

2. Experienced in testing procedures, specifically in using the Visual Efficiency Scale (Barraga, 1970b) for the assessment of low vision

3. Able to assess 10 or more students who met the criteria for participation in the study.

Each teacher was required to attend a 2 1/2 day training session held at the American Printing House for the Blind during the summer of 1978. During the training sessions the rationale of the program was given along with a demonstration in administering the entire assessment procedure. The teacher-evaluators then returned to their respective communities to assess their students. Each teacher-evaluator was asked to test and retest each student within a period of not less than 2 nor more than 3 weeks during the fall of 1978. The teacher-evaluators were paid for their participation in the training session and for each set of test-retest protocols returned to the American Printing House for the Blind.

Results and Discussion

This instrument was examined for content validity as well as from a psychometric standpoint. Both these standpoints are essential to the users of this instrument because a person's performance on the categories of the test are more important to the examiner than the total test score (i.e., educational planning and educational intervention will be based on performance within the eight categories rather than on the test as a whole).

The content validity of the Diagnostic Assessment Procedure is quite good. In constructing the test the developers reported reviewing over 100 articles and books on visual perception, normal visual development, visual impairment, and low vision. In addition, 14 professionals in the areas of visual perception, low vision, and teachers of the visually handicapped served as consultants on the project. The literature review and the input from the consultants provided the basis for the development of the eight functional visual categories and the specific items on the instrument. The eight categories of the instrument appear to be very comprehensive in covering the full range of visual functioning. In addition the items on the instrument are representative of the visual abilities that would be necessary in performing a wide range of school related visual tasks.

The means, standard deviations, and standard errors of the means for the test-retest protocols are shown in Table 3. The average subject obtained a score of approximately 70% on both the

test and retest indicating that the Diagnostic Assessment Procedure was rather easy. A statistical test for skewness of the distribution was significant ($p < .05$). Visual inspection of the distribution showed a negative skewed curve with most scores piled up at the high end of the distribution.

Table 3

Descriptive Statistics for the Test and Retest Assessment

Assessment	Mean	Standard deviation	Standard error of mean
Test	28.4 (71%)	8.5	.81
Retest	28.9 (72%)	8.1	.76

A comparison of the means and standard deviations for both the test and retest demonstrated a high degree of consistency of visual functioning over the period between test and retest with respect to both average level and degree of homogeneity among individuals in the group. The small standard error of the mean indicates that there is a probability of $p < .01$ that the mean score for the population is less than two points on either side of the test and retest means.

Item analysis. No negatively discriminating items were found as a result of either the test or retest. However, there were a few items which deviated substantially in difficulty from other items on the test which warranted special attention. Table 4 shows the list of difficult items for both the test and retest. It should be noted that the same items were found to be difficult on both the test and retest. An analysis of these items revealed that they tended to demand drawing and graphic manipulative skills which predictably would be difficult for persons with visual handicaps.

Table 4

Difficult Items in Test and Retest Assessments

Test assessment		Retest assessment	
Item	Difficulty (%)	Item	Difficulty (%)
9	25	9	17
17	23	17	17
30	21	30	9
34	12	34	11
37	26	37	22
38	41	38	30

Reliability estimates for the Diagnostic Assessment Procedure were based upon internal consistency coefficients (i.e., Kuder-Richardsen 20) and correlations between test and retest results. The reliability coefficients and standard errors of measurement are shown in Table 5. The internal consistency of both the test and retest were identical and very high, r = .94. The errors of measurement were extremely small, and it can be concluded that an individual's true visual efficiency score would probably ($p < .68$) be found within plus or minus two points on either side of his score as measured by this test. The test-retest correlation was r = .96 which indicates that the Diagnostic Assessment Procedure is a highly accurate instrument and that the type of visual functioning measured by the Diagnostic Assessment Procedure does not vary much from week to week.

Table 5

Reliability Coefficients and Standard Errors of Measurement for the Test and Retest Assessment

Assessment	KR 20	Test-Retest correlation
Test	.94	.96
Standard error	2.1	1.7
Retest	.94	
Standard error	1.9	1.6

Hierarchial sequence. It could be hypothesized that a hierarchical sequence from easy to difficult items exists in the assessment procedure. Such a hierarchy may exist in one or both of two types. One type of hierarchy (Type A) would exist if the difficulty of the items progressed systematically from the beginning to the end of the instrument. This type of hierarchy would produce a progressive decrement in the mean percentage scores for categories A through H which would consist of clusters of items organized sequentially from the beginning to the end of the instrument. A second type of hierarchy (Type B) would be based on the assumption that a state of interdependency exists among items (or categories). Success at lower levels in the structure would be necessary before an individual could respond adequately to items at higher levels in the hierarchical structure. A Type A hierarchy is a necessary but not a sufficient condition for a Type B hierarchy.

Evidence for a Type A hierarchy.

1. Hierarchy of item difficulty

   Space precludes the description of item difficulties for all 40 items, but a visual inspection of item difficulty percentages in the item analysis print-out

sheet revealed a slight but nonsignificant tendency (Kruskal-Wallis test, $p > .05$) for later items to be slightly more difficult than early items in the sequence. However, a number of erratic fluctuations in difficulty are in evidence from the beginning to the end of the instrument. Consequently, this evidence does not support the notion of a hierarchy of item difficulty.

2. Hierarchy of category difficulty

If there is a hierarchy of category difficulty then there should be increasing difficulty across categories. Table 6 presents mean percentage scores for categories A-H for both the initial test and the retest results.

Table 6

Mean Percentages for Categories A-H on the Initial Test and Retest

Category	Initial test mean	Retest mean	Number of items	Initial test mean percentage	Retest mean percentage
A	1.87	1.91	2	94	96
B	3.59	3.70	4	90	92
C	4.64	4.63	6	77	77
D	8.85	9.25	12	74	77
E	2.75	2.92	4	69	73
F	2.69	2.50	4	67	62
G	2.24	2.33	4	56	58
H	1.79	1.73	4	45	43

N = 112

The rank order of mean percentages for the initial test range is a descending hierarchy from a high of 94% for category A to a low of 45% for category H and thus provides evidence for the existence of a Type A hierarchy for the category structure. The retest results are similarly hierarchical in structure with the exception of category D. However, the initial test provides better evidence for the existence of a hierarchy because it was not influenced by potential practice effects that may have occurred on the retest.

Evidence for a Type B hierarchy. If a state of dependency exists among items (or categories) in a hierarchial structure such that success on tasks at a given level in the hierarchy is dependent upon the mastery of other tasks at lower levels, then correlations between items at a particular level and items at successively higher

levels should become progressively lower. Similarly, correlations between items at a given level and other items at successively lower levels should become progressively lower. Two different types of analyses were conducted as follows:

1. Items--Tetrachoric correlations were computed among all possible combinations of items. Such correlations describe the strength of the relationship between passing versus failing on one item and passing versus failing on another item. Space does not permit a listing of all of these correlations. However, it can be reported that no trend existed among these correlations in keeping with the assumptions of a Type B hierarchy among items in the test.

2. Categories--Tables 7 and 8 provide evidence related to the possibility of a Type B hierarchy among categories A-H.

Table 7

Correlations Among Categories A-H on the Initial Test

Categories	A	B	C	D	E	F	G	H
	X →							
A	1.00	.72	.67	.59	.43	(.61)	.44	.25
	←	X	→					
B	.72	1.00	.71	(.76)	.59	(.70)	.60	.38
	←		X	→				
C	.67	.71	1.00	.72	.61	(.64)	.54	.40
	←			X	→			
D	.59	(.76)	.72	1.00	.76	.75	.72	.58
	←				X	→		
E	.43	.59	.61	.76	1.00	.62	(.68)	(.63)
	←					X	→	
F	.61	(.70)	(.64)	(.75)	.62	1.00	.64	.52
	←						X	→
G	.44	(.60)	.54	(.72)	(.68)	.64	1.00	.63
	←							X
H	.25	.38	.40	(.58)	(.63)	.52	.63	1.00

N = 112

←→ Arrows indicate direction of predicted trend.

(○) Circles indicate deviation from predicted trends.

The inter-correlations shown in Table 7 show a general tendency for correlation trends to conform to predictions made from the assumption of a Type B hierarchy. The encircled correlation coefficients in Table 7 represent deviations from the predicted trends. A summary of results in Table 8 shows that 73% of the correlations were in keeping with the hierarchial hypothesis. However, the correlations among all categories (including those far removed from a given category level) are too high to permit the conclusion that an individual who does not succeed at a particular level cannot succeed at higher levels of visual functioning.

Table 8

Percentage of Correctly Predicted Correlations on the Initial Test

Category	Percentage
A	86
B	71
C	86
D	86
E	71
F	57
G	57
H	71
	Mean = 73%

N = 112

In summary, for individual items, no evidence exists to support the assumption of either type of hierarchy. At the level of categories, however, it can be concluded that a Type A hierarchy exists but not a Type B hierarchy. In other words, significant differences in difficulty exist as one proceeds from the early category of items to the later categories in this test. However, many exceptions exist to the notion that later categories cannot be responded to adequately by an individual who does not succeed at lower categories.

Construct validity of categories A-H. A factor analysis was conducted on the initial test results. The factor analysis revealed that one factor accounted for 91% of the variance and a second factor accounted for about 5% of the variance. Three other factors were indicated, but were probably not valid. Most of the items were loaded on factor 1. The second factor had high factor loadings on 17 items. Without going into a detailed description of these results, it can be said that there was no correspondence between the factor loading for individual items and the hypothesized categories A-H. If these categories had construct validity, then items for a given category would load highly on that category but would show low loadings on other categories. Such results were not found.

Visual inspection of inter-correlations among categories revealed modest and significant correlations among all categories. In fact, the correlations between test and retest results for the same categories were not substantially larger than the correlations among different categories.

It can therefore be concluded that these categories lack construct validity. There is little evidence that this instrument measures any cluster of traits corresponding to the hypothesized category system. From a measurement point of view, even if these categories were valid, due to the high correlations among all categories, the error of measurement among categories would be too large to permit any diagnostic interpretation to be placed upon differences among category scores unless such differences were rather large.

It should be said, however, that the requirements for factorial construct validity are so rigorous that few, if any, psychological or educational measuring instruments meet such criteria today. Most published reading tests, for example, report substantial inter-correlated subtest scores to be used for diagnostic purposes. Factor analysis of such tests seldom reveal factors corresponding to most subtest titles. Yet, these tests are obviously useful diagnostic tools. They may display adequate content validity and criterion related validity despite the lack of factorial validity.

Paradoxically, despite the previously discussed results concerning the lack of construct validity of this instrument, it would nevertheless be feasible to use this category system as an organizational tool for relating assessment results to treatment procedures. The rationale for this decision would rest upon both the substantial content validity of this instrument and an expected Type A hierarchy among categories. The content of this instrument was based upon a rational analysis by professionals in the field of the visually handicapped as well as psychologists who were knowledgeable in the field of visual perception.

If the category structure were to be used as a diagnostic tool justified on pragmatic if not entirely on rigorous psychometric grounds, it would be necessary that these categories possess a reasonably high degree of reliability and a low degree of measurement error. Results in Tables 6 and 9 provide evidence for this decision.

Table 9

Reliability Coefficients and Standard Error of Measurement for Categories A-H

Category	Reliability*	SD**	Standard error of measurement**
A	.83	.41	.17
B	.84	.91	.36
C	.80	1.31	.59
D	.89	2.84	.94
E	.86	1.26	.62
F	.76	.97	.47
G	.69	1.13	.63
H	.83	1.44	.59

N = 112

* Correlations between pre and post assessment.

** Based on pre-assessment results.

It can be seen that the reliability coefficients in Table 9 are surprisingly high (considering the small number of items in each category) and the errors of measurement are very low. Also, the similarity between test and retest means in Table 6 indicates a remarkable stability in test performance within each category. It should be noted, however, that the reliability coefficients (see Table 9) for categories F and G are lower than the coefficients for the other categories. Careful study should be given to the items in these two categories. Results for categories F and G shown in Tables 7 and 9 also suggest that some unidentified problem exists among the items in these categories. That is to say, the predicted correlation trends in these tables for categories F and G are less precise than for other categories.

One of the limitations of the preceding analysis concerns the nature of the population sample. The results were limited to those individuals who were selected on the basis of visual acuity of 20/200 or less with no additional handicaps (mental or physical) that might interfere with their performance on the test. Furthermore, since the population of visually handicapped persons is quite heterogeneous with respect to the nature of the eye disorder as well as visual acuity and visual field, it is an open question as to the nature of the relationship between these visual characteristics and performance. Empirically, this is a difficult problem to investigate due to the small number of persons that would fall into any category.

In conclusion, the Diagnostic Assessment Procedure is a highly accurate instrument which also displays a high level of content validity for its purpose. More evidence is needed concerning the correlation of performance of this instrument with related variables

to determine its criterion related validity. Within the context of this program the Diagnostic Assessment Procedure instrument seems to be well designed for identifying effective training procedures for use with individuals.

Field Evaluation of the Program to Develop Efficiency in Visual Functioning

The purpose of the final stage of the project was to evaluate the program under actual conditions of use by teachers of visually handicapped students in both residential and public school programs to determine:

1. the extent to which teachers could use the program without training or additional aid
2. if there were any materials or procedures that needed to be modified before the program was finalized for production
3. how the program was used by the teachers and how effective it was.

Method

Subjects. The subjects for this evaluation were 11 teachers of legally blind students who were able to work with one to three visually handicapped students. The criteria for teacher selection were:

1. interest in participating
2. familiarity with the Utilization of Low Vision Kit
3. access to one to three legally blind students during the early part of the 1979-80 school year
4. time to schedule a minimum of 30 minutes per day, 3 days per week, for a period of 8 weeks with each student.

The teachers were selected to represent a wide geographical area as well as public and residential schools. There were six teachers from residential schools and five from public schools. The 11 teachers were from the following states: Arkansas, Louisiana, Nebraska, New Jersey, New Mexico, North Carolina, Minnesota, Ohio, Virginia, and Wisconsin.

The students assessed by each teacher were selected by American Printing House for the Blind project staff from lists of potential students enrolled in a particular teacher's program or school. The criteria for selection were:

1. legally blind--light perception to 20/200 and/or a visual field of 20 degrees or less

2. a minimum of 1 year of educational experience

3. willingness of student and, where appropriate, parent or guardian to participate.

Using these criteria, 22 students (11 males and 11 females) were selected to participate in the field evaluation. The students ranged in age from 5.6 years to 18.5 years with an average age of 10.7 years. The eye conditions listed by incidence as represented in the sample are shown in Table 10. The reader should note that the total number (39) of eye disorders/diseases exceeds the total number of subjects (22) in the sample because several subjects had more than one disorder/disease. Eight subjects (36.4%) were from public schools and 14 subjects (63.6%) were from residential schools. The number of subjects in each of the nine visual categories as suggested by the National Society for the Prevention of Blindness is shown in Table 11.

Table 10

Diagnoses and/or Causes of the Eye Disorders Represented in the Testing Sample (Arranged by Incidence)

Eye conditions (or cause of blindness)	Incidence
Nystagmus	7
Cataracts	6
Glaucoma	3
Optic atrophy	3
Optic nerve damage	3
Albinism	2
Esotropia	2
Retinal detachment	2
Aphakia	1
Coloboma	1
Corneal scarring	1
Head injury	1
Hemianopsia	1
Hyperopic astigmatism	1
Keratoconus	1
Myopia	1
Retrolental fibroplasia	1
Rubella	1
Toxoplasmosis	1

Table 11

The Number of Subjects in the Testing Sample for Each of the Visual Categories as Suggested by the National Society for the Prevention of Blindness

Visual Categories		Number of subjects
I	20/200 - 18/200	4
II	17/200 - 13/200	3
III	12/200 - 08/200	9
IV	07/200 - 03/200	0
V	2.5/200- .4/200	0
VI	Counts fingers	1
VII	Hand movements (includes "forms" and object perception)	1
VIII	Light projection and/or perception (includes shadows)	1
IX	Totally blind	0
Not reported		3

Materials. Each teacher was sent a full set of materials containing all four components of the program. These included:

Section I Theme and Organization of Complete Program
Section II Diagnostic Assessment Procedure
Section III Design for Instruction
Section IV Source Book on Low Vision

Additionally, each teacher was sent an appropriate number of low vision observation checklists and record booklets and two questionnaires designed to evaluate the use of the program by critiquing each component of it.

One questionnaire was an individual lesson evaluation form which consisted of 10 yes/no questions with space provided for reasons/suggestions beside each question. The aim of the questionnaire was to determine whether a specific lesson used by a teacher was clear, useful, and accomplished the teaching objective. A copy of this questionnaire is provided in Appendix B.

Another questionnaire was designed to evaluate the entire Program to Develop Efficiency in Visual Functioning. The questionnaire consisted of 59 yes/no questions with space provided for reasons/suggestions beside each question. The questionnaire was divided into separate components and subcomponents so that each of them could be evaluated individually. The components and subcomponents of the program evaluated by this questionnaire were as follows:

1. Purpose

2. Use of each program component

3. Program guide

4. Diagnostic Assessment Procedure

    a. Preface

    b. Evaluator's guide

    c. Assessment items

    d. Assessment materials

    e. Instructional planning index

    f. Record booklet

    g. Demographic sheet

    h. Criteria for mastery

    i. Summary table

5. Design for Instruction

    a. Guide

    b. Lessons

6. Supplemental Source Book

    a. Glossary

    b. Materials source list

7. Low Vision Observation Checklist

8. Packaging

9. Magnifiers

10. Placement of separate components

11. Program for effectiveness

A copy of the questionnaire is provided in Appendix C. Instructions which accompanied the materials also requested the teachers to make margin notes at any place in the materials where clarification or modification was needed.

Procedure. The teachers selected were contacted by American Printing House for the Blind project personnel according to the criteria established and detailed in the Subject section. Teachers

were asked to submit a list of their students along with identifying data such as age, sex, grade level, visual acuity, field of vision, and eye condition. From this list, a maximum of three students and one alternate were selected with whom each teacher would work. Each teacher was asked to fill out the Low Vision Observation Checklist and administer the Diagnostic Assessment Procedure to each student. On the basis of the assessment, each teacher selected the appropriate lessons to use with each student--as identified in the program--in a course of instruction to improve the utilization of low vision. Each teacher worked with each student for a maximum of 30 minutes per day, 3 days per week, for 8 consecutive weeks. At the completion of the training period, each teacher administered the Diagnostic Assessment Procedure again to determine the nature and extent of the change from pre- to postassessment. Each teacher completed the questionnaire after using the program and returned all materials to the American Printing House for the Blind.

Results and Discussion

The data consisted of information from the questionnaires as to the usefulness of various components of the program, along with suggestions for improvement; margin notes critiquing the program; and pre- and postassessment data. The field evaluation questionnaire is presented in Appendix C and shows how the teachers responded to each of the 59 questions along with their comments. Wherever the consensus of the teachers indicated that some part of the program needed revision or clarification, their specific comments enabled American Printing House for the Blind personnel to pinpoint the source of the difficulty so that appropriate changes could be made. A summary of the responses to each of the components of the program is as follows:

1. Purpose--The purpose and use of the program was clear to 82% of the teachers. Of the teachers who reported having a problem, only one teacher provided a written comment that stated that the program was "clear but the amount of reading was overwhelming." Consequently, no changes were made in the purpose.

2. Use of each program component--All the teachers stated that they would read completely or read parts of and skim the rest of the Program Guide, Diagnostic Assessment Procedure, and the Design for Instruction. For the Supplemental Source Book, 82% said they would only skim it. However, none of the teachers found any of the components unnecessary.

3. Program Guide--All the teachers found the Program Guide to be clearly written with adequate content and appropriate information.

4. Diagnostic Assessment Procedure--All the teachers found the Evaluator's Guide clear, appropriate, and consistent with

respect to the rationale and information presented. However, there were specific problems with some of the assessment materials, namely:

a. Penlights--These were found to be functioning improperly and consequently were replaced with different penlights that had been field tested previously.

b. Work Mats--The work mats tore easily and/or did not unfold easily. Consequently, these were replaced with felt work mats that eliminated both problems found in the field evaluation.

c. Six Million Dollar Man Doll--A number of problems were indicated with the doll and, consequently, a different doll was substituted in the kit.

d. Cards and Shapes--The problems specified have primarily concerned difficulties related to manipulating and sorting the cards. Consequently, the packaging of these materials was changed to facilitate sorting and ease of manipulation.

5. Design for Instruction--91% of the teachers found the Design for Instruction clearly written, useful, and lessons properly sequenced.

6. Supplemental Source Book--91% of the teachers found the Sourcebook to be appropriate in content, clearly written, and useful. However, 70% of the teachers did not use any items that were listed in the Materials Source List in working with their students. The primary reason given was lack of time during the school day.

7. Low Vision Observation Checlist--90% of the teachers found the Checklist to be appropriate in format and content.

8. Packaging--Although 91% of the teachers found the packaging adequate, 40% had specific suggestions for improving it. These suggestions focused on making a lighter weight container with better handles. Consequently, the packaging was redesigned to conform to these suggestions.

9. Magnifiers--These were included in the program so that teachers who had students that could benefit from using magnifiers would have them readily available. There were no specific assessment items or lessons in the program that addressed the use of magnifiers. However, it was apparent that a large percentage of the teachers did not know how to assess a student's needs with respect to the use of magnifiers. Since magnification is discussed in the Source Book on Low Vision and detailed instructions on the assessment and use of magnifiers by low vision students was beyond

the scope of this program, no additional instructional materials were added to the program. However, the decision was made to include three magnifiers in the program for those teachers and/or learners who know how to use them.

10. Placement of Separate Components--80% of the teachers stated that the Program Guide should be kept as a separate volume. However, it was found that after the Program Guide was edited in final form, the number of pages were so few that it became apparent that it was uneconomical and impractical to keep it as a separate volume. Consequently, the Program Guide and Diagnostic Assessment Procedure were combined into a single volume.

11. Program Effectiveness--All the teachers found the program to be effective with 91% rating it as excellent and 9% found it very useful but limited in scope. Unsolicited comments from the teachers indicated that the program was precisely what they needed in order to identify students' visual abilities and functional limitations and to improve visual functioning using prepared lessons in a sequential procedure. Additional data on the use and effectiveness of the program are evident from the performance of the students in the Diagnostic Assessment Procedure which was given as a pretest before instruction and as a posttest after instruction. The means, ranges, and standard deviations of the assessment time on the pre- and postassessment, the number of days between the pre- and postassessment, and the pre- and postassessment scores are shown in Table 12. The amount of time necessary for administering the Diagnostic Assessment Procedure decreased substantially from the pre- and postassessment administration. The preassessment required 132.27 minutes to administer, while the postassessment required 95.24 minutes to administer. The mean number of days between the pre- and postassessment was 62.81 days. On the preassessment the students' mean performance was 27.27 items, and on the postassessment it was 31.68 items. The difference between the pre- and postassessment scores was significant ($t = 6.43$, $df = 21$, $p < .001$). Of the 22 students in the study, 20 students showed a gain from pre- to postassessment, one showed no change, and one student showed a decline of just one item from pre- to posttest. The range of changes from pre- to postassessment test extended from 1 to 11 items. In the previous study the mean number of items correct on the preassessment was 28.4 which compares favorably to the mean of 27.27 on the preassessment of the present study. On the postassessment of the previous study the mean was 28.9 items. Since there was no significant change from the pre- to postassessment in the previous study in which no instruction was given between the pre- and postassessment, this outcome suggests that the instructional program was effective in increasing the visual efficiency of low

vision students. Of more specific interest are the changes from pre- to postassessment as a function of the category structure. Table 13 shows the score and percentages on pre- and postassessments, the mean percentage change from pre- to postassessment, and the number of students who showed a positive, negative, or no change from pre- to postassessment. There were little or no changes from pre- to postassessment on the items in the first two categories (A and B) of the Diagnostic Assessment Procedure. This was due to the fact that almost all the students got these items correct on the preassessment and these represent the lowest level of visual functioning on the instrument. The largest changes occurred in Category E which involves items related to figure ground discrimination, part-whole relationships, and memory for detail, where the students showed a 20.50% increase from pre- to postassessment. It should be noted that on the postassessment, the data indicated a sequential difficulty from Category A to Category H after instruction, and that 50% of the students were unable to complete these items. These data suggest that the instructional program could be used over a longer period than the approximately 8 weeks used in the present study in order to increase the use of low vision beyond that found here.

Table 12

Summary of Statistics on the Pre- and Postassessment

	Mean	Range	Standard deviation
Number of days between pre- and postassessment	62.81	36-98	14.87
Administration time on preassessment (in min.)	132.27	60-270	57.89
Administration time on postassessment (in min.)	95.24	45-180	37.94
Preassessment scores (number of correct items)	27.27	4-38	9.76
Postassessment scores (number of scorrect items)	31.68	4-40	10.43

Table 13

Change from Pre- to Postassessment on Each Visual Category (A-H)

	Pretest		Posttest		% Mean change from pre- to posttest	No. of subjects who showed (+) change	No. of subjects who showed (-) change	No. of subjects who showed no change
	$\bar{X}$	SD	$\bar{X}$	SD				
A(2)	2	0	2	0				
%	100%		100%		0%	0	0	22
B(4)	3.82	0.50	3.86	0.47				
%	95.50%		96.50%		1.00%	2	1	19
C(6)	4.50	1.71	5.18	1.53				
%	75.00%		86.33%		11.33%	11	1	10
D(12)	8.55	3.51	9.95	3.71				
%	71.25%		82.92%		11.67%	15	1	6
E(4)	2.23	1.31	3.05	1.43				
%	55.75%		76.25%		20.50%	12	0	10
F(4)	2.45	1.30	3.00	1.35				
%	61.25%		75.00%		13.75%	12	1	9
G(4)	2.18	1.30	2.64	1.40				
%	54.50%		66.00%		11.50%	10	1	11
H(4)	1.55	1.47	2.00	1.57				
%	38.75%		50.00%		11.25%	9	3	10

N = 22

After administering the preassessment all the teachers were able to select the appropriate lessons to be used as part of an instructional program. As a group, 141 of the 150 lessons were used by one or more of the teachers. The lessons used and the number of times each lesson was used is shown in Appendix D. Each teacher made margin notes on each of the lessons they used indicating changes they wanted made. In addition each teacher completed an individual lesson evaluation form for each lesson actually used with a student. The margin notes on all the written materials were compiled, summarized, and reviewed by American Printing House for the Blind personnel and appropriate changes were made in the written material. All written material was then given to a professional editor for final editing before being turned over to production.

In summary, the field evaluation showed that the program could be used by teachers of the visually handicapped, without additional training, to facilitate the use of residual vision in low vision students. A number of problems with the materials were identified and corrected after which all written material was professionally edited for publication.

The final version of these materials is called the Program to Develop Efficiency in Visual Functioning. The program components are contained in two packages which also serve as carrying cases. Package 1--DIAGNOSTIC ASSESSMENT PROCEDURE--contains materials needed for assessment. These materials should be used for no other purpose. They include Volume 1, Diagnostic Assessment Procedure; 10 copies of the Low Vision Observation Checklist; 10 copies of the Diagnostic Assessment Procedure Record Booklet; and graphics and other materials used for assessment. Package 2--DESIGN FOR INSTRUCTION--includes Volume 2, Design for Instruction; a Source Book on Low Vision; an Instructional Planning Index; 150 sequenced lessons in eight categories on color-coded cards; graphics for use with the lessons; and three optical aids. Lists of commercially available materials appropriate for use with the instructional program are in the source book.

The Program is available from the American Printing House for the Blind in Louisville, Kentucky.

References

Ashcroft, S. C., Halliday, C. & Barraga, N. Study II: Effects of experimental teaching of the visual behavior of children educated as though they had no vision. Nashville, Tenn.: George Peabody College for Teachers, 1965. (USOE Grant No. 32-52-0120-1034)

Barraga, N. C. Increased visual behavior in low vision children. American Foundation for the Blind Research Series, 1964, No. 13.

Barraga, N. C. (Ed.). Teacher's guide for development of visual learning abilities and utilization of low vision. Louisville, Ky.: American Printing House for the Blind, 1970. (a)

Barraga, N. C. (Ed.). Visual Efficiency Scale. Louisville, Ky.: American Printing House for the Blind, 1970. (b)

Barraga, N. C., & Collins, M. E. Development of efficiency in visual functioning: Rationale for a comprehensive program. Journal of Visual Impairment & Blindness, 1979, 73, 121-126.

Barraga, N. C., Collins, M., & Hollis, J. Development of efficiency in visual functioning: A literature analysis. Journal of Visual Impairment & Blindness, 1977, 71, 387-391.

Berla', E. P., Rankin, E. F., & Willis, D. H. Psychometric evaluation of the low vision Diagnostic Assessment Procedure. Journal of Visual Impairment & Blindness, 1980, 74, 297-301.

Harley, R., & Spollen, J. A study of the reliability and validity of the Visual Efficiency Scale with low vision children. Education of the Visually Handicapped, 1973, 5, 110-114.

Holmes, R. V. Training residual vision in adolescents educated previously as non-visual. Unpublished master's thesis, Illinois State University, 1967.

Ozias, D. K. An evaluation of a research information dissemination and translation vehicle: Special study institutes on utilization of low vision. Unpublished doctoral dissertation, University of Texas at Austin, 1975.

Willis, D. H. Relationships between visual acuity, reading mode, and school systems for blind students. Exceptional Children, 1979, 46, 186-191.

Appendix A

Project Consultants

Project Consultants

Mrs. Marianne May Apple
Editor, Low Vision Abstracts
34 Wellesley Road
Upper Montclair, N. J. 07043

Dr. Edward P. Berla'
Coordinator
Vision Impairment Program
Department of Special Education
School of Education
University of Louisville
Louisville, Kentucky 40208

Mrs. Joyce Bromley
Sight Conservationist
Materials Center for Visually Handicapped
Knoxville City Schools
925 Oglewood Avenue, Room 24
Knoxville, Tennessee 37917

Mrs. Pat Carpenter
Education Consultant
Visually Impaired Program
KeKalb County School System
Department of Special Education
The Robert Shaw Center
385 Glendale Road
Scottdale, Georgia 30079

Mrs. Ruth Holmes
Educator and Consultant
Illinois School for the Visually Handicapped
658 East State Street
Jacksonville, Illinois 62650

Mrs. Wilma A. Hull
163 Grove Street
Lexington, Mass. 02173

Dr. Randy Jose
Center for the Blind
36th Street and Lancaster Avenue
Philadelphia, Pennsylvania 19104

Dr. Rosemary O'Brien
Supervisor Vision Services
Vision Services Center
Montgomery County Public Schools
5010 Moorland Lane
Bethesda, Maryland 20014

Dr. Douglas K. Ozias
Deputy Director
Governor's Coordinating Office for the Visually Handicapped
Stokes Building
Suite 105
Austin, Texas 78701

Dr. Earl F. Rankin
Professor of Education
Department of Curriculum and Instruction
College of Education
University of Kentucky
Lexington, Kentucky 40506

Dr. Rona Willen Shaw
Institute of Child Study
Kean College of New Jersey
Morris Avenue
Union, New Jersey 07083

Mrs. Rose Skolnick
Head, Vision Stimulation Program
Overbrook School for the Blind
64th Street and Malvern Avenue
Philadelphia, Pennsylvania 19151

Miss Mildred Smith
Teacher
Texas School for the Blind
1100 West 45th Street
Austin, Texas 78756

Dr. Dean W. Tuttle
Associate Professor, Area Coordinator
University of Northern Colorado
Greeley, Colorado 80631

Appendix B

Individual Lesson Evaluation Form

Individual Lesson Evaluation Form

Lesson No._____ Student_____ Teacher_____

	Yes	No	Reasons/Suggestions
1. Did the lesson address its objective?			
2. Was the procedure clear?			
3. Were you able to use this lesson in working with the student?			
4. Were the tangible materials necessary for teaching the lesson easily acquired?			
5. Were the materials listed on the lesson plan sufficient to teach this lesson?			
6. If graphics were included in this lesson, did you think they were clear and sufficient to teach what was intended?			
7. Were the response criteria specific enough so that it was clear whether the learner performed correctly or incorrectly?			
8. Were the procedural notes clear and helpful?			
9. Was the section on additional activities adequate?			
10. Overall did you find this lesson useful?			

Appendix C

Field Evaluation Questionnaire

Program to Develop Efficiency in Visual Functioning
Field Evaluation Questionnaire

Name_____

Address_____

Telephone No._____

A. Did you have any problems in understanding the purpose and use of the Program to Develop Efficiency in Visual Functioning?

Yes 2 No 9 If yes, please comment.

2 It was clear and complete but the amount of reading was overwhelming.

B. Write the letter of the statement below that best describes how you would use each component.

A. Read completely or actually use the materials
B. Read parts, skim the rest
C. Skim
D. Would not find it necessary to read or use

9A,2B Section I--Program Guide

10A,1B Section II--Diagnostic Assessment Procedure

8A,3B Section III--Design for Instruction

9B,2C Section IV--Supplemental Source Book

If you have not read Sections I and IV completely, please do so before answering the following questions. Check Yes or No in the appropriate column to indicate your response to each question. If your response is No, please give reasons and suggestions for revision in the space provided at the right.

SECTION I--PROGRAM GUIDE	Yes	No	Comments/Suggestions
1. Was the content of this section adequate?	10	0	
2. Was the information presented clear and understandable?	10	0	
3. Was the amount of information presented in the Program Guide appropriate?	11	0	Concise and to the point.

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Section II includes questions on the Preface, Evaluator's Guide, Assessment Items, Assessment Materials, Instructional Planning Index, and Record Booklet. The following questions refer to each of these parts separately.

	Yes	No	Comments/Suggestions
Preface			
4. Was it helpful to have the definitions in the preface?	8	3	The three teachers who responded no, were already familiar with the definitions and did not need to refer to them, but felt they would be helpful to others.
Evaluator's Guide			
5. Is the rational clear and consistent?	11	0	
6. Was the amount of information presented in the Evaluator's Guide appropriate?	11	0	One respondent felt the instructional planning index was confusing. Two teachers responded by saying it was useful.
Assessment Items			
7. Were the objectives of the items stated clearly?	11	0	One respondent found them wordy. Three commented that they weren't very clear.

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Assessment Items	Yes	No	Comments/Suggestions
8. Were the visual tasks stated clearly?	11	0	One respondent felt they were all clear except No. 5.
9. Did you understand which assessment materials/graphics should be used with each item?	11	0	One respondent did not like the laminating.
10. Was the format of the directions appropriate?	11	0	One respondent liked having the directions printed in capital letters.
11. Were the responses on the items clearly stated so that you could determine whether mastery had been achieved?	11	0	

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Assessment Materials

Please indicate if you encountered any problems in using the assessment materials listed below. If you check Yes, please indicate to the right what specific problems you had and suggestions you have for improvement.

Problems Encountered With:	Yes	No	Comments/Suggestions
12. Penlights	8	3	All comments indicated that there were serious problems with the penlights in that they did not function properly.
13. Patterned Ball	3	8	No comments given.
14. Work Mats	5	6	All comments indicated one or more problems with the mats (i.e., they broke apart, tore, or did not unfold easily).
15. Tape (Black and Yellow)	2	9	The incorrect length of tape was apparently included in one kit. There was no comment by the other respondents.

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Assessment Materials	Yes	No	Comments/Suggestions
16. Wooden Geometric Shapes	1	10	No comments given.
17. Cubes (Blocks)	1	10	No comments given.
18. Pegs	1	10	No comments given.
19. "Six Million Dollar Man" Doll	4	6	Two respondents did not use the doll provided in the kit for inexplicable reasons. One respondent let the kids play with the doll after testing. One respondent failed to check a box. One respondent thought it hard to reattach arm.
20. Toy Car	2	9	No specific problems indicated

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Assessment Materials	Yes	No	Comments/Suggestions
21. Cards and Shapes (Laminated Cards)	5	6	One respondent suggested making the cards thicker. Three respondents had difficulty manipulating the cards and shapes. One respondent thought there might be a problem with glare but didn't notice any problems on the part of the testees.
22. Was it clear that the materials listed above were to be used only when administering the Diagnostic Assessment Procedure?	10	1	No specific problems indicated.
Instructional Planning Index			
23. Were you able to identify the appropriate lessons to use after you administered the Diagnostic Assessment Procedure?	9	1	One respondent did not check a box. Two respondents experienced some difficulty relating items on the Diagnostic Assessment Procedure to specific lessons. All other comments were positive.
Record Booklet			
The Record Booklet consists of four parts, namely, the Demographic Sheet, the Assessment Items Record Booklet, the Criteria for Mastery, and the Summary Table. The following questions refer to each of these parts separately.			

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

	Yes	No	Comments/Suggestions
Demographic Sheet			
24. Was the kind of information requested appropriate?	11	0	Three respondents reported having difficulty in getting information from eye reports.
25. Was the amount of detail adequate?	10	1	One respondent felt there was too much information requested. One respondent requested a diagram of visual field be included.
26. Was the format appropriate?	11	0	
Assessment Items Record Booklet			
27. Was the format clear and appropriate?	11	0	One respondent felt there could have been more room for comments.
Criteria for Mastery			
28. On the items that involved drawing or writing, were the criteria adequate to determine if the student had achieved mastery? (If no, which one(s) need clarification?)	10	1	One respondent felt the criteria was too subjective. One respondent suggested that examples of passes and failures be included.

SECTION II--DIAGNOSTIC ASSESSMENT PROCEDURE

Record Booklet	Yes	No	Comments/Suggestions
Summary Table			
29. Was the summary table useful?	10	1	No specific problems or suggestions.
30. Was the format appropriate	10	1	One respondent had difficulty relating summary table to the instructional book.

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SECTION III--DESIGN FOR INSTRUCTION

Section III includes questions on the Guide and the Lessons. The following questions refer to each of these parts separately.

Guide	Yes	No	Comments/Suggestions
31. Was the statement concerning the purposes of the Design for Instruction clear and adequate?	11	0	One respondent suggested that specific page numbers be used in referring to location of suggestions.
32. Was the information provided useful and necessary?	10	1	One respondent suggested consolidating some information on "psychological attitudes" in Section II with Section III.
33. Was the Basis for Planning Lessons section clear and adequate?	10	1	One respondent had difficulty in going from the assessment to the most appropriate lesson. One respondent thought there could have been more specific information.
34. Was the Evaluation of Progress section specific enough for application?	11	0	

SECTION III--DESIGN FOR INSTRUCTION

Lessons	Yes	No	Comments/Suggestions
The lessons were divided into 8 separate sections (A-H). The following questions pertain to those sections.			
35. Were the types of activities, concepts, and information presented in each of the sections appropriate and adequate?	11	0	
36. Were the number and type of lessons adequate and appropriate?	9	1	One respondent failed to check a box. One respondent thought more lessons were needed in Section G.
37. Was the sequence of the lessons reasonable?	11	0	
38. Did the lessons correspond to the designated assessment items?	11	0	

SECTION IV--SUPPLEMENTAL SOURCE BOOK

In addition to questions on the entire Source Book, there are also questions on the Glossary and Materials Source List. The following questions refer to each of these parts separately.

	Yes	No	Comments/Suggestions
39. Was the content of the Supplemental Source Book appropriate for the purposes of the Program to Develop Efficiency in Visual Functioning?	10	0	One respondent failed to check a box. All comments given were positive.
40. Was the information in the Supplemental Source Book clear and understandable?	11	0	One respondent felt it could have gone a little more in-depth.
41. Was the amount of detail in the Supplemental Source Book appropriate?	10	1	One respondent thought that more information should have been included on neurological and motor lags. One respondent thought there was too much information.
Glossary			
42. Did you find the definition of terms in the Glossary needed and useful?	10	1	No specific problems indicated.

SECTION IV--SUPPLEMENTAL SOURCE BOOK

Materials Source List	Yes	No	Comments/Suggestions
43. Did you find the Materials Source List useful?	10	1	No pertinent comments.
44. Was the format appropriate?	11	0	Would like lessons cross referenced with materials list.
45. Did you use any items listed on the Materials Source List? (If your answer is Yes, please describe what and how you used them.)	3	7	One respondent failed to check a box. Materials list was rated well even though the teachers did not have time to order and use the materials.
46. Was the number of supplemental commercial materials annotated adequate?	11	0	

OTHER

The following are questions regarding the Low Vision Observation Checklist, Packaging, Magnifiers, Placement of parts of the program, and Program Effectiveness. The questions refer to each of these parts separately. On the first four questions, check Yes or No in the appropriate column to indicate your response to each question. If your response is No, please give reasons and suggestions for revision in the space provided at the right. The last nine questions are open-ended. Please give us your comments and/or ideas on those questions.

	Low Vision Observation Checklist	Yes	No	Comments/Suggestions
47.	Was the format appropriate?	10	1	One respondent found the format confusing because it wasn't clear who was to fill it out.
48.	Was the amount of information requested necessary and/or useful?	11	0	One respondent suggested more questions be included on TV viewing. Other comments indicated the information requested was useful but not always available.
	Packaging			
49.	Did you think the packaging of the program was adequate?	10	1	One respondent felt the box the program came in was a little awkward to handle.

OTHER

	Packaging	Yes	No	Comments/Suggestions
50.	Do you have any suggestions for improving the packaging of the program?	4	6	One respondent failed to check a box. Respondents suggested a lighter weight carrying case with better handles.

Magnifiers

51. Of the three magnifiers included, two for near and one for distance, which was the most used?

Eight respondents did not use the magnifiers either because they did not know how to use them or the particular students they were working with did not require them. Two respondents found the 2X magnifier most useful--one of these also found the 7X useful.

52. Of the two for near, which would you prefer for overall use by the children?

Five respondents did not have a preference. Two respondents preferred the 2X or the 7X. One respondent thought a stand magnifier would be useful and one respondent thought a headborne magnifier would be useful.

53. Do you think all three magnifiers should be included?

Yes 4 No 1 Five were undecided.

Placement

54. Do you think the program guide should be combined with Section II (Diagnostic Assessment Procedure) and bound in one volume or should they be kept as separate and distinct volumes?

Eight respondents suggested keeping them separate and two respondents thought they should be in one volume.

OTHER

Placement
55. Should the observation checklist be part of the record booklet or kept separate from the record booklet? Six respondents said separate and four said to keep it with the record booklet.
56. Where would be the best place to put the criteria for mastery for the drawing/writing items? Six respondents indicated that its present position was the best. Four respondents suggested four different places, namely; in Diagnostic Assessment Procedure booklet, the page preceding the item, on the page where the child is drawing, and on the back of the Diagnostic Assessment Procedure.
57. Where would be the best place to put the Instructional Planning Index? Five respondents indicated Section III, two had no comment, one with the summary chart, one didn't know, and one after the summary chart.
Program Effectiveness
58. How effective do you think the program was in identifying weaknesses and then training legally blind students to utilize their low vision? Ten respondents rated as excellent and essential, one respondent found it useful but limited.
59. Do you have any general or specific comments about any aspect of the program? Four respondents reiterated their praise of the program, one had no comment, others had comments that were not specific to the program such as needing better eye reports, not having enought time in their work days, how to select children for training from among those available, need more information on the use of regular print.

Appendix D

Frequency of Lessons Used

Frequency of Lessons Used

Lesson No.	No. of Times Each Lesson Was Used	Lesson No.	No. of Times Each Lesson Was Used
1	3	48	3
2	3	49	3
3	3	50	3
4	3	51	5
5	3	52	4
6	3	53	3
7	3	54	4
8	3	55	3
9	3	56	2
10	3	57	4
11	3	58	4
12	3	59	6
13	3	60	7
14	3	61	9
15	2	62	10
16	3	63	9
17	2	64	8
18	2	65	4
19	1	66	3
20	1	67	3
21	3	68	2
22	4	69	2
23	4	70	1
24	6	71	1
25	5	72	2
26	8	73	3
27	7	74	2
28	6	75	1
29	6	76	2
30	5	77	3
31	11	78	1
32	11	79	0
33	4	80	0
34	4	81	0
35	5	82	2
36	3	83	1
37	5	84	3
38	4	85	6
39	4	86	4
40	4	87	4
41	4	88	4
42	4	89	4
43	4	90	3
44	5	91	1
45	4	92	1
46	4	93	0
47	3	94	1

Lesson No.	No. of Times Each Lesson Was Used
95	0
96	0
97	1
98	7
99	5
100	7
101	3
102	2
103	6
104	5
105	6
106	6
107	7
108	3
109	4
110	7
111	8
112	7
113	1
114	1
115	0
116	2
117	1
118	2
119	1
120	3
121	1
122	1
123	1
124	1
125	1
126	1
127	5
128	5
129	3
130	3
131	4
132	4
133	4
134	2
135	2
136	2
137	3
138	2
139	2
140	2
141	3
142	4
143	1
144	2
145	1
146	2
147	0
148	0
149	2
150	1